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September 1970

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Brown, R. G. B., "FOOD CHOICE BEHAVIOUR" (1970). *Bird Control Seminars Proceedings*. 199.
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FOOD CHOICE BEHAVIOUR

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It is only natural to take a rather defensive attitude to the question of bird control; the Indians, so to speak, are all round the stockade, and they must be fought off at all costs. And so we surround our orchards and vineyards with batteries of gadgets designed to keep the enemy at bay—designed, as often as not, without any clear understanding of what will actually frighten a bird away. This is the obvious strategy, but it is not always the best one. It may be more useful to have some basic biological information on why the "attack" is being launched in the first place.

Newton (1966) has put the matter very well:

"In the past, many attempts to deal with pest-species have begun with expensive research on chemical deterrents and poisons. Most of these 'blood and thunder' methods achieved little or no lasting success but have resulted in considerable wastage of public money and unnecessary destruction of other wildlife. Recent studies have adequately demonstrated that any attempt at pest control must be preceded by a thorough study of the pest's biology (work which many would consider of academic interest only). But only with such basic knowledge, are we likely to be able to formulate a sound control policy that is economically and morally justifiable—a simple principle, but all too often forgotten in the past."

It may well be, of course, that 'blood and thunder' methods *are* the best; Newton himself recommends a controlled killing programme to prevent damage to fruit buds by Bullfinches. The point is that a biological approach can tell us which control systems are likely to work, and how they should be applied for maximum effect, before one gets to the stage of investing in hardware.

I should like to use my own research to illustrate this point. Since 1965 the Canadian Wildlife Service has been concerned with the damage which birds cause in the orchards and vineyards of the Niagara fruit belt, in southern Ontario. My own contribution to this programme has been to collect information on the feeding behaviour and ecology of the birds concerned, and use this to test the effectiveness of various control systems. For the purposes of this seminar, I shall only deal with the damage which Robins do to sweet cherries. Here, I was particularly interested in whether it was possible to develop a "bird-proof cherry variety, which would settle the problem once and for all. Obviously, there was no point in plunging at once into a long and expensive cherry breeding programme; instead, I investigated as many aspects as possible of the birds' feeding preferences. One can, of course, do this at any number of levels, from physiological investigations of taste mechanisms up to the relationship between Robins and fruit in the ecosystem as a whole. I looked at the following possibilities:

1. *Which varieties do Robins prefer?*

The Canadian Wildlife Service organised a survey among the Niagara growers, and this showed that it was the early varieties of cherries which were usually the most severely damaged—for example, Seneca, Vista, Venus and Black Tartarian; apart from ripening time, though, the vulnerable varieties had little in common—they varied widely in such factors as sugar content and pH. However, the results of so broad a survey were hard to interpret, since they took no account of the preferences of different species (Grackles and Starlings also eat cherries, and the relative numbers of these and the Robins change during the season). All one could conclude was that the presence of an early, vulnerable variety had no obvious effect on the amount of damage to other trees in the orchard. It did not act as a "loss leader" inducing the birds to damage other varieties as well; but, at the same time, it did not significantly distract the birds from the other varieties either.

It seemed simpler to regard a mixed orchard as a food-choice experiment, and watch where the Robins fed in it. In 1967 I watched a rectangle of 12 sweet cherry trees made up, in order of ripening, of: i. 3 Vista; fruit "black" (that is, very dark red). ii. 3 Venus, 3 Sam; fruit "black". 3 Sue; fruit "white" (= pale red). The Vista were picked on July 10, and the others on July 22.

The average number of Robins visiting each variety $\frac{1}{4}$ -hour was:

	Vista	Venus	Sam	Sue
June 25 - July 9	5.9	0.8	0.9	0.3
July 10 - July 21	0.8	2.1	0.9	0.2

This shows that the Robins preferred "black" to "white" cherries. In fact, they concentrated on the earliest "black" variety and ignored the other two even though the latter were, by July 9, far riper than Vista had been on June 25. They only switched to Venus after the Vista had been picked, and even then continued to make unrewarded visits to Vista for several days. All this suggests that learning is as important as any "innate" preference for taste or colour in influencing a bird's preferences for fruit; they choose the first variety to ripen in the orchard, and keep to it for as long as it is available.

The importance of learning was underlined by the birds' preferences among the Vista trees. My only colour-marked Robin used to fly past trees #1 and #2, to land and feed in #3; but this was rather unusual since most birds, irrespective of their direction of flight, preferred #1. Tree #3 was smaller than the others, but they all seemed to me to be equally ripe. At picking time, these puzzling preferences were translated into c.70% damage to trees #1 and 3, against only c.20% to #2. In terms of time and motion, it must be more efficient for a Robin to return to the same tree, instead of exploring the whole orchard at every visit. But effects of this kind make it very difficult even to assess the damage the birds do, let alone the varieties which they prefer to do it to.

2. *What factors immediately stimulate a Robin to eat a cherry?*

These observations suggested that "white" cherries, at least, might be "bird-proof". To test this, I caught Robins in cherry orchards, caged them individually,

and tested each with a mixture of 30 cherries made up of:
 i. 10 "black", sweet (Vista, Venus or HRIO #48021). ii.
 10 red, sour (Montmorency). iii. 10 yellow, sweet (Gold
 Maraschino).

I tested 7 birds in 1969, and the totals eaten were:

	Black	Red	Yellow
test #1	44	37	1
#2	61	50	0
#3	58	50	37

Evidently, the birds used redness as an index of ripeness in the first two trials; by the third, they had learnt that the yellow cherries were also ripe, and began to eat these too. Physiologically, "ripeness" must imply a fairly broad spectrum of tastes, since the Robins continued to eat sour cherries even after they had learnt that yellow cherries were sweet. (In the same situation, Starlings rejected the sour as soon as they discovered the yellows).

Once the birds have learnt to take yellow cherries, this must be retained for some time. I tested an eighth bird in 1969, which I had banded and released after it had learned to eat yellow cherries in similar tests in 1968; unlike the inexperienced birds, it took yellow cherries right from the start.

So the answer, perhaps not surprisingly, is that because learning plays so important a part in Robin feeding behaviour, and because the spectrum of preferred "tastes" is so wide, it would be impossible to devise a "bird-proof cherry--unless, of course, it was so unpalatable as to be "human-proof as well. A Gold Maraschino tree in an orchard of "black" cherries would be safe enough—but if nothing but Golds were grown, the birds would soon learn to eat them. Since the whole evolutionary point of a cherry is to be eaten so that its pit can be carried somewhere else, we ought not to be too aggrieved if it attracts birds as well as ourselves.

So far I have used food choice experiments to show how one can examine one possible control system, but they have a far wider application than this. Whatever their variety, cherries form only part of the Robin's diet, and it is important to see how they fit in with other items, especially animal food. The point here is to get some idea of how strong the Robins' compulsion is to eat fruit; if it is strong, it will not be easy to deter them.

3. *What factors control the Robin's diet as a whole?*

I first thought of the Robin as a bird which fed mainly on animal food, only taking fruit during a limited season. Actually, the reverse is true. Fruit seasons are longer than one usually realises, and berry fruits form a major part of the Robin's diet except in spring and early summer, when none are available.

Paradoxically, the early cherry season is also a period when Robins take a relatively high proportion of animal food. This is because the parents collect insects and worms for their young, even though they may eat fruit themselves. To measure this, I collected faeces from nests, and from perches used by adult Robins, and checked each faeces for the presence or absence of fruit, insect and worm remains. For the period July 6 - August 16 1969 the figures are:

	No. faeces containing:			No. examined:
	Fruit	Insects	Worms	
Nests	77 (34.1%)	215 (95.1%)	199 (88.0%)	226
Adults	194 (80.8%)	160 (66.7%)	61 (25.4%)	240

There is a clear difference; the adults can find worms and insects for the young, but have a positive preference for fruit. In fact, Robins hunting on lawns are just as successful in finding animal food during the cherry season as they are before the fruit ripens.

The high proportion of animal food in the diet of the young is undoubtedly related to their nutritional requirements; they need protein for growth. Fruit eating later on in the season is also nutritionally important, to migrant Robins. Migrating birds need a large fat reserve as a food supply, and the quickest way of getting this is to take on a concentrated sugar solution; this, of course, is exactly what fruit is.

All this means that we must stop subconsciously thinking of Robins as "intruders" in orchards and vineyards, whose depredations are somehow abnormal, and therefore easily diverted. On the contrary, eating fruit plays a key role in the Robin's diet, and any measures we take to counter it have to be thorough, and designed to exploit the birds' limitations as far as possible. And for this, the biological approach becomes even more important.

Reference:

Newton, I. 1966. The Bullfinch problem. Oxford Research (no pagination).

Species names:

American Robin
Bullfinch
Common Grackle
Starling

Turdus migratorius
Pyrrhula pyrrhula
Quiscalus quiscula
Sturnus vulgaris